USEPA Comments on the May 2000 Draft Operations and Maintenance Plan (O&M Plan)

General Comments:

All sections should be completed, such as sections 5.1.4 and 5.2, and Appendices A, B, and C.

Response: At present, the submittal of shop drawings, the associated review, and the fabrication of several of the major components of the landfill gas and leachate management system are still in process. It is thus not possible to complete all subsections of the O&M Plan at this time. At the time of the Prefinal Inspection, an O&M Plan (containing all available component information) will be submitted as required in the Summary of Major Deliverables/Schedule, which is contained within the Statement of Work (SOW).

The O&M Plan should include an O&M cost estimate with annual cost projections over the duration of the O&M period, including useful life/equipment replacement costs. (Also, for the current capital cost estimate (Appendix D of the Final design), delete the second contingency factor (for indirect capital costs) or explain why a second factor is needed.)

Response: Cost estimates for construction and annual O&M were included in the approved Remedial Design (RD) Report. Therefore, cost estimates were not included in the O&M Plan as this would have been redundant with the RD cost estimates. Furthermore, the SOW does not require a cost estimate to be included with the O&M Report submittal (see Task 5 of the SOW).

In regard to the useful life/equipment replacement costs, the previously approved annual O&M cost estimate included 10 percent of the equipment capital cost for equipment replacement on an annual basis. With regard to the capital cost estimate, it is common practice to place a 15 percent contingency on both direct and indirect capital costs to cover unforeseen expenditures during construction.

See the PSVP general comment on the contingency plan for leachate pretreatment needed in the O&M Plan.

Response: Please see the response to the third general comment of the PSVP. An appropriate contingency plan has been developed as part of Subsection 8.3.3 of the PSVP.

Specific Comments:

1. *Section 1.1: The bulletized list should contain monitoring wells, gas monitoring probes, and fencing.*

   Response: Bullets for monitoring wells, gas monitoring probes, and fencing have been added to Subsection 1.1.

2. *Section 1.2: Explain the difference between the landfill cover and final cover. If these terms are identical, use only one term.*

   Response: The "final cover" term has been deleted as it is repetitious of "landfill cover."

   The bulletized list should include all of the items in Task 5 (including corrective action) in the Statement of Work of the April 14, 1999 Unilateral Administrative Order. For any items that are already included in other stand-alone documents, refer to the other documents. Each item in the expanded, bulletized list should then be described in a separate section in the O&M Plan.

   Response: It is important to note that this O&M Plan was written to target an audience of field technicians who would be directly responsible for the normal operations and maintenance of the equipment and systems constructed as part of the RA and who would not necessarily be responsible for the long-term monitoring requirements and overall performance verification of the system. As the above comment indicates, it is appropriate to reference certain tasks that are included in other stand-alone documents. For the eight specific subtasks included in Task 5 of the SOW, the following responses/references apply:

SUBTASK	RESPONSE/REFERENCE
Description of normal O&M	Included in Sections 2, 3, and 4 of the O&M Plan
Description of potential operating problems	Included as Section 5 of the O&M Plan
Description of routine monitoring and laboratory testing	Routine system monitoring and process control are detailed in Section 3 of the O&M Plan. Long-term monitoring tasks, QA/QC, performance verification, and procedures to petition the USEPA on the frequency/level of monitoring are included in the PSVP, which includes the QAPP and FSAP as attachments.
Description of alternate O&M	Included as Section 6 of the O&M Plan.

SUBTASK	RESPONSE/REFERENCE
Corrective action	Performance-based corrective action described in Section 8 of the PSVP.
	System/Maintenance-based corrective action included in Sections 4, 5, and 6 of the O&M Plan.
Safety plan	Included as Section 7 of the O&M Plan
Description of equipment	Included in Section 2 and Appendices A and B of the O&M Plan.
Records and reporting mechanisms required	Included as Section 8 of the O&M Plan. In general, O&M progress reports will be included as part of the quarterly progress reports described in Section 7 of the PSVP.

Subsection 1.2 has been edited such that references to specific sections in the O&M Plan or PSVP are more clearly stated.

3. <u>Section 2.1:</u> ***In the second paragraph, state that the primary operational procedure for the leachate collection system should also include regulating the leachate pumping rate from each leachate extraction well.***

Response: The above text has been incorporated into the second paragraph of Subsection 2.1.

4. <u>Section 3.2.1:</u> ***Besides leachate levels being measured in extraction wells, leachate levels should also be measured at locations that will be capped. Also, note the comment for Section 3.4.2 of the FSAP. This comment does not recommend using leachate extraction for measuring leachate levels.***

Response: See the response to Comment 11 (Subsection 3.4.2) of the FSAP, which addresses leachate elevation monitoring within the landfill.

5. <u>Section 4.4.1:</u> ***The mowing frequency described in the text does not match that of Table 4-1. Mowing should occur monthly from May through October or as necessary. Growth of vegetation should never exceed one foot. Modify this section and Table 4-1 accordingly.***

Response: The text in Subsection 4.4.1 has been changed to be consistent with Table 4-1 and now reads "Mowing and trimming of vegetation will be conducted as necessary, to control volunteer deep-rooted weeds and grasses, with this activity occurring at least once per year." From Table 13 of the ROD, the action-specific ARAR for mowing is 35

IAC 807.622(d)(3), which contains no reference to the required frequency of mowing or the maximum height of vegetative growth, with the exception of a reference to an annual mowing cost. Based on industry experience, a mowing frequency of once per year is sufficient to control vegetation on landfill facilities.

6. *Table 4-1: The landfill cover inspection line items should also include inspections for areas of ponding (described in section 4.4.2 as surface water on top of the cover system in an area of more than approximately 100 square feet) and/or poor drainage.*

Response: Quarterly inspection for ponding of surface water has been added to Table 4-1.

Inspection of fencing and signs should be done during regular monthly inspection instead of quarterly inspection. Also, the leachate pump operation should be verified monthly instead of quarterly.

Response: From Table 13 of the ROD, the ARAR for post-closure maintenance is 35 IAC 811.111. This ARAR requires a quarterly inspection of vegetation for the first 5 years after closure, but makes no reference to the inspection frequency of fencing and signs. Because the inspection of the perimeter fence is readily conducted in conjunction with the overall inspection of the condition of vegetation, a quarterly inspection frequency is adequate for the H.O.D. Landfill site. The frequency of verification of pump operation has been changed to be consistent with the monitoring frequency outlined in the FSAP.

Inspection of vaults with wellheads located within is not included in the table or text. The inspection should be done monthly.

Response: In Table 4-1, the row with the heading "LFG Wells/Probes" has been modified to read "LFG and Leachate Extraction Wells." Inspection of the integrity of vaults on a monthly basis has been added to the list of actions for this row. In addition, the vault inspection has been added to Subsection 4.2.1.

7. *Section 7: According to the ROD, a contingent, active, groundwater remediation alternative will be considered if VOCs in the groundwater are found to be migrating or if remedial actions taken do not cause a decrease in groundwater contaminant levels. The O&M Plan should describe the contingent remedy in this section.*

Response: See the response to the second item of Comment No. 2. Contingency action plans are discussed in full in Section 8 of the PSVP, including contingencies for active groundwater remediation.

Change every "may" to "will" in subsections 7.1.1 and 7.1.2.

Response: Section 7 (Corrective Measures) has been deleted from the O&M Plan and reincorporated into Section 8 of the PSVP. The suggested wording has been incorporated into Subsection 8.5 of the PSVP.

8. *Table 7-2: The table states that the adequacy of the leachate collection system to lower leachate levels throughout the landfill will be evaluated over the course of several years. A more precise plan should be developed. Several years does not convey the confidence that the system will work properly. The evaluation should be more aggressive to determine of the adequacy of the system.*

Response: Section 7 (Corrective Measures) has been deleted from the O&M Plan and reincorporated into Section 8 of the PSVP. Subsection 8.4 of the PSVP contains a discussion of contingency actions, should evaluations determine that the leachate collection system is not performing adequately.

9. *Section 9.2: Add the following two topics to each O&M report:*

   1. **A summary of all approved and unapproved changes made since the last report submission**
   2. **A summary of all problems or potential problems encountered during the reporting period and actions taken to correct the problems**

Response: The above items have been added to the Reporting Section of the O&M Plan.

Since the selected remedy for groundwater is Monitored Natural Attenuation, a separate report should be submitted annually to USEPA evaluating whether groundwater contamination is naturally attenuating.

Response: As noted in Subsection 7.2 of the PSVP, the annual report will contain an assessment of the effectiveness of natural attenuation. WMI believes that this assessment is most appropriately included as part of the annual report, not apart from it.

10. *Section 9.3.1: Provide the inspection forms in Appendix C.*

Response: Inspection forms have been added to Appendix C.

Section 1
Introduction

1.1 Background

This Operation and Maintenance (O&M) Plan has been prepared as a component of the Remedial Design (RD) for the H.O.D. Landfill (site). This O&M Plan provides guidelines for the long-term operation and maintenance of remedial action (RA) components at the site. The RA components addressed in this O&M Plan are as follows:

- Landfill cover
- Leachate collection system
- Landfill gas (LFG) collection system
- Monitoring wells
- Gas monitoring probes
- Fencing

This O&M Plan is supplemented by the Remedial Action (RA) Completion Report, and has been prepared prior to remedial action ~~implementation~~completion; therefore, the construction "record" drawings and contractor submittals will be included in the RA Completion Report. This plan may require modification if an end-use plan for the site is implemented. The site-specific RA Health and Safety Plan (HSP) should be reviewed to obtain historical and construction safety-related information.

The purpose of this O&M Plan is to provide guidelines for the operation and maintenance of the RA system components. It is not intended to be a substitute for proper training and experience. On-site training and experience with the system components will be required to complement the information in this plan. Modifications will be incorporated in the plan to accommodate any changes in system operations and manufacturers' information as system components are replaced or modified during the operation and maintenance of the system as part of the RA.

1.2 Scope

This plan describes O&M activities to be performed as part of the RA. This plan addresses the following subjects as they relate to the landfill cover, leachate collection system, and LFG control system~~, and final cover~~:

- System equipment and operations - Section 2

~~System maintenance~~

- System monitoring and process control - Section 3
- System equipment and maintenance - Section 4
- Potential operation problems - Section 5
- Alternate operating and maintenance procedures - Section 6

~~Contingency measures~~

- Safety plan - Section 7
- Reporting of O&M activities - Section 8

Activities related to environmental monitoring are included in the Field Sampling and Analysis Plan (FSAP) submitted with the RD. In addition, the tracking of performance objectives and the corresponding corrective actions are detailed in Section 8 of the Performance Standards Verification Plan.

Section 2
System Equipment and Operations

2.1 General

This section provides guidelines for the startup, routine operation, and shutdown procedures for each major system component of the systems in place at the site. The procedures contained herein are not intended to address every possible operating situation and do not provide a substitute for proper training and experience.

Proper O&M of the leachate collection and LFG control systems are essential to ensure that the systems function safely and effectively. The primary operational procedure for the leachate collection system entails keeping the collection pumps, associated piping, and the loadout facility in good operating condition and the regulation of the leachate pumping rate from each leachate ~~extractoin~~extraction well. The primary operational procedure for the LFG system involves regulating and adjusting the applied vacuum and gas flow rate at each extraction well. The procedure is referred to as "balancing" or "tuning" the gas system. A balanced system requires that each well be adjusted to extract the maximum amount of landfill gas possible while maintaining control of migration and without causing an excessive amount of air intrusion into the waste.

Detailed manufacturers' operating and maintenance manuals for the various system components are provided in the appendices to this O&M Plan. All manufacturers' instructions should be read and understood prior to operating the equipment.

2.2 Landfill Gas Collection System

2.2.1 Dual Extraction Wells

Dual leachate and LFG extraction wells are installed within the landfill. As-built construction details for each well are included as an appendix to this plan **[insert upon completion of the RA]**.

Each wellhead is located within a vault beneath the final cover surface. There is the potential for surface water to collect in the vault. Any collected surface water may be removed by opening the valve located on the small-diameter hose extending from the gas header lateral pipe at the base of the vault. The vacuum in the lateral pipe should be sufficient to draw the water into the well where it will be collected with leachate.

Each dual extraction well consists of specific components for leachate extraction and for LFG collection. The primary components for leachate extraction include the vertical well, the pneumatic pump, controls, the compressed air line, and a leachate forcemain. The LFG collection components of the well include the vertical well, the vacuum controlling wellhead, and connections to the header line. The arrangement of these components and the vault ~~that~~ in which they are contained in are shown on the RA construction record drawings ~~[to be supplied after completion of RA construction]~~.

Sample ports located on the LFG extraction wellhead are to be used to monitor the concentrations of methane (CH_4), nitrogen (N) as balance gas, oxygen (O_2), carbon dioxide (CO_2), and temperature. The orifice plate in the wellhead will be used to monitor flow.

The objective of the extraction wells is to extract the maximum amount of LFG from the area surrounding each well while minimizing the amount of air intrusion into the waste. For the LFG control system, the above measurements will determine the performance as follows:

- Vacuum readings ensure that the control valve is open and the vacuum is available to the well.
- CH_4 concentration measurements determine if the well is producing LFG or drawing air into the system.
- Flow measurements quantify the amount of gas production and assist in positioning the valve at each well.
- Temperature and O_2 measurements identify air intrusion and potential underground fire problems.

Refer to Section 3 for detailed wellhead monitoring and adjustment procedures.

2.2.2 Collection Header Network

The collection header network conveys gas to the blower and flare and condensate to the condensate collection sumps. All underground header pipe is constructed of (SDR 17) high-density polyethylene (HDPE). Prior to system operation, isolation valves on the main header and laterals should be fully opened. In the event that the gas or leachate extraction system becomes damaged, portions of the lines may be isolated for repair by closing the required isolation valves. Operation of the valves installed within the header pipe will be as recommended by the manufacturer.

2.2.3 Condensate Collection System

Four condensate sumps are placed at the low points of the main header to allow for the removal of condensate from the system. The design of the sumps allows for the operation of the sumps under vacuum conditions of the LFG collection system. Collected condensate within the sump will be pumped into the leachate forcemain with a pneumatic pump. The pneumatic pump will be operated in accordance with the manufacturer's data included in Appendix B. The pneumatic pumps will be powered by the air supply line. This allows for the condensate to be removed from the header while preventing any air from entering into the extraction system.

Prior to placing the condensate sumps into operation and after any work on the air supply headers, the air supply header should be purged of water and foreign debris. This can be accomplished by removing the air line from the air supply header at the condensate sump(s) that is (are) the furthest from the blower building and then opening the isolation valve on the air supply header. Under normal circumstances, the operation of the condensate sump(s) is completely automatic. Condensate will be pumped directly to the leachate forcemain.

2.2.4 Blower

One centrifugal blower is installed in the blower building. The system also includes a fail-close solenoid valve located upstream of the blower that closes when the blower shuts off. The blower should be operated in conjunction with the flare system, as recommended by the blower flare system manufacturer. All flare components are located within a 6-foot-high security fence. This fence should remain closed and locked at all times when the system is unattended.

2.2.5 Flare System

[UPDATE SECTION ONCE MANUFACTURER'S INFORMATION ON THE BLOWER FLARE BECOMES AVAILABLE.]

The flare is located approximately 30 feet from the blower building. Sample ports are located on the gas line leading to the flare on either side of the eccentric orifice plate flow meter and the flame arrestor. A flame arrestor is located at the inlet to the flare to prevent the propagation of the flame into the pipeline in the event that a combustible mixture is present in the pipeline. Other components of the flare system are as follows:

- Temperature monitor and recorder
- High-temperature shutdown
- Low-temperature shutdown

- Automatic restart

Initial Startup Procedures

Before initiating operation of the flare system, operation personnel should familiarize themselves with the recommended safety precautions and operation procedures detailed in the Flare Operations and Maintenance Manual provided by the Flare Manufacturer (Appendix A). Furthermore, a competent technical consultant must be present at the initial startup and operation of the flare system. Thereafter, only qualified personnel are allowed to work on or around the flare and to perform the checks (mechanical, electrical, and equipment).

Automatic Operation (Routine Operation)

1. Position "Start-Up Mode" switch to "AUTO."
2. Turn "Solenoid Valve and Blower" switches to the "AUTO" position.
3. Turn the "Control Power" switch to the "ON" position.
4. Observe the system operation sequence on the control panel, as follows:
   - Purging
   - Purge completed
   - Pilot gas valve opened
   - Flame proved
   - Solenoid valve open
   - Blower running

Shutdown Procedures

1. Turn the "Blower" switch to the "OFF" position at the flare control panel.
2. Turn the "Solenoid Valve" switch to the "CLOSE" position at the flare control panel.
3. Turn the "Control Power" switch to the "OFF" position.

2.2.6 Blower Building Ancillary Equipment

In addition to the blower, the blower building is equipped with a ventilation fan, heater, and gas detection devices.

Initial Startup Procedures

Prior to placing the blower building into service, the following tasks must be performed. Refer to the specific equipment manufacturers' manuals (Appendix A) for detailed instructions on performing these tasks.

1. Set building heater thermostat to 50°F.
2. Set building exhaust fan thermostat to 80°F.
3. Calibrate the building LEL sensors for explosive gas.
4. On the MSA gas monitoring system located on the flare control rack, set the caution, warning, and alarm points for each LEL sensor at 5, 8, and 10 percent of the LEL, respectively.

Routine Operation

The blower building exhaust fan will operate under the following three conditions.

1. If the internal building temperature exceeds 80°F (automatic mode);
2. If a methane concentration above 10% of the LEL is detected (automatic mode);
3. If the "Blower Building Exhaust" switch located on the flare control panel is turned to the "ON" position (manual mode);

Upon entering the blower building, the "Blower Building Exhaust" switch located on the flare control panel must be turned to the "ON" position and the building must be allowed to vent. When the building is entered, the doors must remain in the open position. Additionally, the explosive gas monitoring system located outside of the building must be checked to ensure that the atmosphere in the building is safe. The atmosphere is considered safe if, and only if, no caution, warning, or alarm lights are lit on the gas monitoring system and the LEL level is below 5 percent.

2.3 Leachate Collection System

2.3.1 Air Compressor and Dehydrator System

The building is equipped with an explosion-proof air compressor that provides the compressed air to drive the leachate and condensate pumps and operate the fail-closed valve in the header pipe. Perform the following checks and adjustments prior to starting the compressor. Refer to the air compressor Operations and Maintenance Manual

2.3.3 Leachate Forcemain

The leachate forcemain is relatively free of specific requirements that need to occur for normal use.

2.3.4 Leachate Tank and Loadout Facilities

Components of the leachate tank and loadout facilities are to be operated in accordance with the manufacturer's recommended procedures (i.e., tank, valves, pump, etc.) included in Appendix B.

Normal leachate loading out operations will involve a vacuum tanker truck or regular tanker truck. The number of tanker trucks required for disposal of leachate off-site will be determined by the quantity of leachate collected. At a minimum, the number of tanker trucks provided will be sufficient to keep the collection tank from completely filling. In the event leachate is collected in quantities ~~which~~ that cannot be handled through routine tanker truck hauling, an alternative operating plan will be implemented as discussed in Subsection 6.2.

During leachate loading operations, at least one entrance gate to the loadout facility is to remain unlocked. After the ~~completion of~~ loading of the leachate truck is completed, all locks will be replaced.

2.4 Landfill Cover

Once constructed, the landfill cover will not require specific operating controls. However, the landfill cover, maintenance road, and surface water drainage features will need regular maintenance. Inspection and maintenance of the final cover system are discussed in Section 4.

Section 3
System Monitoring and Process Control

3.1 Landfill Gas Collection System

Monitoring is required to evaluate the LFG extraction system operation and performance. Routine monitoring of operating parameters is also necessary to ensure the effectiveness and continued safe operation of the LFG extraction system. Operation of the LFG extraction system consists mainly of regulating and adjusting the amount of vacuum applied to each extraction well through the use of valves. This adjustment of vacuum, and therefore flow rate, is referred to as "balancing" the gas system. A balanced system is one in which each well is adjusted to extract the maximum amount of gas possible while controlling migration and without causing excess amounts of air to be drawn into the landfill.

Monitoring will be performed only by trained personnel who have the proper equipment. The equipment referenced in subsequent sections of this text is recommended for proper system monitoring. Equipment will be internally calibrated according to manufacturers' instructions prior to use. Monitoring is to be conducted in accordance with the approved RA monitoring plan. Forms for monitoring performance of the system are included in Appendix C.

3.1.1 Well Monitoring

All of the gas collected by the system is extracted from the wells. Therefore, the monitoring and adjustment of individual wells is the most important aspect of operating the gas extraction system. The other system components operate and are adjusted in order to most effectively utilize the wells. For example, the intake vacuum on the blower is set such that enough vacuum is delivered to wells to establish the most effective radius of influence. The valves located throughout the system are used to allow for partial isolation of the system. Wells will be monitored for methane, carbon dioxide, balance gas, oxygen, temperature, pressure (vacuum), and valve setting.

Control Valve Setting

To monitor the individual wells, perform the following steps:

1. Visually inspect the wells for loose bolts, hose clamps, pipe, and connections, etc.
2. Note and record the valve setting by the number of visual ticks or turns (from the closed position).

3.1.2 System Monitoring

The capability to monitor the system as a whole is provided at the blower station. The pressure, the methane (positive and negative), carbon dioxide, balance gas (nitrogen), and oxygen contents; and the outlet gas flow rate will be monitored. The following steps outline the procedures for monitoring each of these parameters:

Measuring Pressure

1. Take pressure measurements prior to gas sampling being careful not to introduce atmospheric air into the monitoring port. Connect the hose on the low side of a magnehelic pressure gauge to the monitoring port prior to opening the valve. Open the valve, and record the pressure. Close the valve.
2. Perform the above procedure on both the positive pressure and vacuum sides of the blower.

Measuring Methane, Carbon Dioxide, Balance Gas (Nitrogen), and Oxygen Contents

1. Attach the inlet hose of the gas monitoring instrument to the monitoring port, prior to opening the valve. Open the valve, and turn the instrument on to draw a gas sample. Allow the readings to stabilize (typically about 60 seconds), and record the values.
2. Let the monitoring instrument purge itself with air (disconnect inlet tubing and allow pump to run) such that it reads zero or is representative of the atmospheric air prior to proceeding with sampling.
3. Balance gas is the remaining percentage of gas after the percentages of methane, carbon dioxide, and oxygen are added together.

$$\text{Balance Gas} = 100\% - (\%CH_4 + \%CO_2 + \%O_2)$$

If the oxygen content of the extracted LFG is greater than or equal to 2 percent, or if the methane content is less than 40 percent, monitor each of the wells to identify and reduce the oxygen concentration or increase the methane concentration.

Measuring Flow Rate

- Measure the flow rate with the orifice plate mounted directly in the gas pipe. Follow manufacturer's recommended procedures for use of the orifice plate to determine flow rates.

- An alternative method is to measure flow rate by the pitot tube method. Follow manufacturer's recommended procedures for use of the pitot tube to determine flow rates.

Measuring Flare Temperature

[TO BE EDITED ~~ONCE SPECIFICS OF FLARE ARE KNOWN.~~WITH MANUFACTURER'S RECOMMENDATIONS]

The LFG flare will be operated at temperatures ranging from 1,400°F and 2,100°F. Operation of the flare above the 2,100°F will damage the ceramic refractory inside the flare. To maintain system efficiency, the flare also will not be operated below 1,400°F. The set point temperature of the flare is the temperature that the flare system will try to maintain. Typically, the flare will maintain a temperature within 20°F of the set point temperature. Therefore, the set point temperature should be set approximately 100°F above the low temperature requirement.

1. A display of both the set point temperature and the actual combustion temperature is provided on the flare control panel. Record the actual combustion temperature on the LFG Extraction System Report form located in Appendix C.

3.1.3 LFG Process Control

Landfill gas is typically generated at a mixture of approximately 50 percent methane and 50 percent carbon dioxide. A high methane concentration usually indicates that more gas is being generated than is being extracted by the well. A low methane concentration is the primary test for determining if the applied vacuum should be changed. In order to operate the gas extraction system effectively, the system must be balanced. Balancing is the process of adjusting the vacuum applied to each extraction well in order to extract the gas stored within the landfill initially and then to extract the gas that is being generated.

Because methane production in the landfill is dependent upon many factors, the amount of vacuum required to extract the gas will vary at each well and also with time. Generally, a vacuum of only 1-2 inches of water column is applied to the extraction wells along the system's perimeter. Experience has shown that this will usually be adequate to control gas migration and that greater vacuums usually result in excessive air intrusion due to the large area of exposed landfill cap within the radius of influence of these wells.

Whenever any part of the active gas extraction system is shut down for more than 1 day, the entire system may require balancing. Changes in one part of the system will likely affect the entire system. Careful monitoring is extremely important in operating a dynamic gas extraction system. The goals of system balancing are as follows:

- To control gas migration.
- To adjust the vacuum to maximize the methane concentration and minimize the oxygen content.
- To maintain extraction well methane levels well over the upper explosive limit (UEL) of 15 percent by volume.
- To maintain the extraction rate at or near the production rate to avoid depleting the gas reservoir and to prevent oxygen infiltration into the landfill.

In order to balance the system, the following steps will be taken:

1. Monitor the gas pipe at the blower station, for pressure, methane, carbon dioxide, balance gas (nitrogen), and oxygen.
2. Compare the measured pressure with the previously recorded stabilized steady-state pressure, and adjust the main control valve in the blower house accordingly. The object is to adjust the main control valve so that methane and pressure readings are approximately the same as those previously recorded.
3. Adjust each well to its previously stabilized pressure (if known), beginning at the well closest to the blower and proceeding around the loop.
4. If small adjustments in a wellhead valve cause very large swings in the applied well pressure, readjust the blower station butterfly valve to a less negative pressure. Incrementally close the butterfly valve until the wellhead butterfly valve can better adjust the applied well pressure.
5. Adjust each well of the branch to its previously stabilized pressure. Then, proceed back toward the blower station, readjusting each well. In this way, each well will be adjusted twice, except the well at the end of the loop.
6. Adjust gas extraction wells individually as indicated in Table 3-1.

3.1.4 Perimeter Gas Probe Monitoring

The gas probes monitor the migration of landfill gas off-site. As part of the system performance evaluation, the perimeter probes must be monitored for methane, oxygen, and pressure. The following steps will be performed at each perimeter probe:

Measuring Pressure

1. Measure pressure prior to gas sampling, taking care not to introduce atmospheric air into the monitoring port.

2. Connect the hose on the low side of a magnehelic pressure gauge to the monitoring port prior to opening the valve.
3. Open the monitoring port, and record the pressure.
4. Close the monitoring port.

Measuring Oxygen and Methane Contents

1. Monitor the methane and oxygen content using the gas monitoring instrument in conjunction with the sample port.
2. Follow the procedure described in Subsection 3.1.2 (System Monitoring) for using the instrument, and record the methane and oxygen content.

3.2 Leachate Collection System Monitoring

Monitoring the performance of the leachate extraction system requires gathering the information necessary to determine whether the pumps are running and whether liquids are being removed. In addition, the leachate collection tank has high and low liquid level sensors and a level indicator on the control panel indicating when the collection tank requires emptying.

3.2.1 Leachate Head Levels

Liquid level measurements in the extraction wells will be performed by direct measurement or a dedicated level indicator. Follow the equipment manufacturer's recommendations for all monitoring. Leachate head levels will be only measured after the leachate collection system has been shut down for at least a 12-hour period to allow liquid levels to stabilize.

3.2.2 Flow Measurement

Flow measurement from each well will be conducted by recording the cycle counter reading on the pump controller. Each cycle represents a known quantity of liquid based on the type of pump utilized.

3.2.3 Tank Level

~~Monitoring of the~~ The tank leachate level will be ~~done~~ monitored on a continuous basis and will be tied to the PLC for observation from off-site. For specifics of the leachate tank level monitoring equipment and operation, see Appendix B.

3. Inspect well assemblies for loose bolts, cracks in pipes, air or water leaks in pipes, broken valve handles, evidence of differential settlement (such as stretching of the flex hose), or other evidence of integrity failure.
4. Ensure that well manholes are locked at all times when unattended.
5. Inspect the integrity of the well vaults.

4.2.2 Landfill Gas Header and Lateral Piping Network

Monitoring of vacuum, methane concentration, temperature, and flow rate at the wells will identify any problems in the piping system. Two problems that may be encountered are surging and pipe breaks. Surging is a cycle of restricted and unrestricted gas flow caused by condensate trapped in low points of the header.

1. Normal maintenance of the piping consists only of operating the buried service valves quarterly.
2. If normal monitoring and operation of the system indicates the presence of surging or a pipe break, the following procedure should be followed:
   - Close the buried service valves on the problem length of pipe to isolate it from the system. Close all wellhead valves on the isolated portion of the header.
   - Excavate the pipe in the area where the settlement or break is most likely to have occurred. Repair the damaged pipe.
   - Replace and recompact cover material over the pipe.
   - Open isolation and wellhead valves.
3. All valve boxes are to be locked at all times when unattended.

4.2.3 Condensate Sumps

The following maintenance tasks are to be performed quarterly.

1. Remove weeds and debris from around the pump stations.
2. Check to see that the pumps are functioning properly.
3. If the pumps should require repairs or maintenance, isolate the pump station from the vacuum in the header system. Refer to the pump manufacturer's Operations and Maintenance Manual for troubleshooting information (Appendix B).
4. Ensure that all condensate sump station encasements are locked at all times when unattended.

4.2.4 Blower

[TO BE VERIFIED AFTER BLOWER FLARE INSTALLATION.]

4.3.2 Leachate Extraction Pumps

All pneumatic pumps should be maintained according to the manufacturer's recommendations. In addition, all pumps should be pulled routinely from the well for visual inspection and cleaning. Worn parts are to be replaced as needed. Connecting hoses and valves should be checked for wear or damage and replaced as needed.

4.3.3 Leachate Collection Tank and Loadout Facility

The leachate loadout facility will require periodic mowing to keep vegetative growth in control.

Maintenance of specific components of the leachate collection tank and loadout facility should follow the manufacturer's recommendations included in Appendix B.

4.4 Cover Maintenance

Maintenance of the cover system involves inspecting and repairing potential settlement areas, those areas bare of vegetation, and those areas affected by erosion.

4.4.1 Mowing

~~Mowing and trimming of vegetation~~ Vegetation will be mowed and trimmed ~~at least~~ as necessary, but no less frequent than ~~annually 3 times per year~~ annually to control volunteer deep-rooted weeds and grasses. Care will be taken not to overcut or otherwise damage grass/vegetation during mowing activities.

4.4.2 Settlement

Differential settlement may occur over time as the result of waste decomposition and liquid extraction. Settlement is not expected to be a significant problem since the waste has been in-place and subject to decomposition for a minimum of 18 years. Repairs will be made if settlement results in ponding surface water on top of the cover system in an area of more than approximately 100 square feet. Existing topsoil in the affected area will be stripped and stockpiled adjacent to the area. General soil will be used to fill the settled area to restore uniform grades and promote drainage. Topsoil will be replaced, reseeded, and mulched. Areas of repairs greater than 1 acre will be documented with a letter report and a drawing. The report will provide a narrative description of the settlement problem and the repair activities. The drawing will show the location of the final cover surface area repaired and the revised grading for the area.

Table 4-1
Maintenance Schedule Summary

EQUIPMENT/ACTION	WK	MO	QTR	6 MO	YR	AS NEEDED
Landfill Cover						
1. Inspect for vegetation stress.		~~X~~	X			
2. Inspect for erosion.		~~X~~	X			
3. Inspect condition of vegetation.			X			
4. Mow/Cut vegetation on an as-needed basis, but at least ~~three times per year~~annually.					X	
5. Inspect for ponding of surface water			X		~~X~~	
46. Reseed or regrade.			~~X~~			X
~~5~~7. Correct differential settlement.						X
Site Security						
1. Inspect security fencing and signage.			X			
2. Lubricate locks.					X	
Leachate Pumps						
1. Verify pump operation (monthly for first year of operation).			~~X~~X			
2. Remove pump and inspect for frayed cables, looseness of the impellar, and general condition.					X	
3. Clean pumps of corrosion and buildup of biological growth.						X
~~4. Clean out siltation in well.~~						~~X~~
Leachate Storage Tank and Loadout Area						
1. Inspect condition of vegetation and security fence. Mow or cut vegetation as needed.		~~X~~	X			
2. Inspect leachate loadout facilities.		X				
LFG and Leachate Extraction Wells~~/Probes~~						
1. Inspect for settling, weeds, and debris. Remove weeds from around vault.		X				
2. Inspect integrity of hardware, locks, pipes, and valves.		X				
3. Inspect integrity of vault.		X				
4. Clean out siltation in well.						X
Extraction System Piping						
1. Inspect for settling, weeds, leaks, water.			X			
2. Operate header isolation valves.					X	
3. Inspect for surging of condensate.			X			
Condensate Sumps						
1. Inspect and remove weeds and debris from around pump stations.			X			
2. Check for leaks and proper functioning of pumps.		X				
3. Inspect pump stations for leaks.					X	

Table 4-1 (Continued)
Maintenance Schedule Summary ~~(Continued)~~

EQUIPMENT/ACTION	WK	MO	QTR	6 MO	YR	AS NEEDED
Leachate Collection Tank						
1. Inspect and remove weeds and debris from around the tank.			X			
2. Check and record condensate level in tank. Arrange for liquid disposal if necessary. ~~Conduct Daily daily inspection~~ Record liquid levels daily through PLC.	X					
3. Remove pump and inspect for wear. Clean and perform maintenance.					X	
4. Check for leaks, visible damage, or corrosion.		X				
Blower Facility						
1. Inspect piping, fittings, valves, and seals for leaks or breakage.		X				
2. Check for belt condition, loose connections, or vibration at blower.		X				
3. Check operation of the fail-closed valve.		X				
4. Check building heater.		X				
5. Check building exhaust fan.			X			
6. Inspect fire extinguishers.			X			
7. Lubricate blower motor bearings.			X			
8. Lubricate blower bearings.			X			
9. Lubricate building exhaust fan.				X		
10. Calibrate building gas detection sensors.				X		
11. Check motor/blower alignment.					X	
12. Tighten electrical connections on motor control panel and at motor.						

Table 4-1 (Continued)
Maintenance Schedule Summary

Air Compressor and Dehydrator System [VERIFY WITH MANUFACTURER'S INFORMATION]						
Flare						
1. Drain flame arrestor.		X				
2. Check propane level.		X				
3. Visually inspect ignitor.		X				
4. Remove weeds or debris.			X			
5. Lubricate air louvers.			X			
6. Visually inspect refractory.			X			
7. Inspect solenoids.			X			
8. Clean/Inspect flame scanner view and vent.			X			
9. Purge blower motor lubrication.			X			
10. Clean flame arrestor.					X	

Table 5-1
LFG Collection System Troubleshooting Checklist

SYMPTOM	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
Vertical extraction well high oxygen/ nitrogen concentration	1. Loose or leaky test port connection	1. If the plastic tube fits loosely on the quick connect coupling or does not effect a positive seal,	1. Use Teflon tape liberally to effect a better seal.	1. Plug and redrill test port.
	2. Bad or loose hose connection with meter	- check hose connection, and	2. Fix hose connection.	2. Fix hose connection.
	3. Bad/Leaky gasket at wellhead or valve	- check gasket and flange.	3. Place duck tape around the flange.	3. Replace gasket.
	4. Bad well seal	4. None of the above causes were found – historically a good well.	4. Adjust valve setting lower or shut off.	4. Repack or rehydrate wellhead seal with bentonite.
	5. Overdrawing on the well	5. None of the above causes were found. Check cover integrity.	5. Adjust valve setting lower or shut off.	5. Repair cover, or none; well may be past maximum production.
Low methane concentration (<40%)	1. Air leak	1. See high oxygen/nitrogen concentration troubleshooting.		
	2. Overpulling on the well	2. Check well's past history of typical vacuums.	2. Adjust valve setting lower.	2. Check well reading in next monitoring event.
High nitrogen/ balance gas (>10%)	1. Air leak	1. See high oxygen/nitrogen concentration troubleshooting.		
	2. Overpulling on the well	2. Check well's past history of typical vacuums.	2. Adjust valve setting lower.	2. Check well reading in next monitoring event.
Fluctuating static/delta pressure readings "Surging"	1. Partial condensate blockage in lateral	1. Listen to well lateral for surging of LFG or gurgling of condensate.	1. If significant, shut off well and drain condensate.	1. May need to regrade lateral.
	2. Main header pipe partially blocked by condensate	2. Listen for surging or gurgling of condensate; check for differential settlement between header and sump.	2. Check operation of nearest condensate sump, or repair drain line from header to sump.	2. May need to regrade header or inspect condensate sump.
Low flow from well	1. Significant leachate in well restricts LFG flow	1. Check liquid level and leachate pump.	1. Continue to pump liquid from well.	1. None.
	2. Waste decomposed	2. Check waste placement records.	2. None.	2. None.
	3. Well screen clogged	3. Televise well screen.	3. None.	3. Abandon well, and replace with a new well.

Table 5-3
Flare Station Troubleshooting Checklist

SYMPTOM*	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
Loss of ignition	1. Blower malfunction	1. See Table 5-2.	1. See Table 5-2.	1. See Table 5-2.
	2. Methane concentrations less than 30%, oxygen >10%	2. Check access port between blower and flare. Check flow rate and gas concentration to confirm that they are within the design parameters of the flare.	2. Verify readings. Obtain a complete set of extraction well monitoring data.	2. Adjust wellfield in accordance with Section 3.
	3. Thermocouple failure	3. Check recorder chart for temperature data at failure. Visually inspect thermocouple and wiring. Check to see if all thermocouples are reading approximately the same. Discontinuity of a thermocouple will cause a high temperature shutdown.	3. Select alternate thermocouple.	3. Repair thermocouple or wiring.
	4. Flame scanner failure	4. Check flame scanner.	4. Verify clear line of sight to flame.	4. Service flame arrestor.
	5. Flare louver failure	5. Check louver throw by adjusting manual louver.	5. Reset manual louvers.	5. Check louver operation if flame temperature is not steady.

Table 5-4
Liquid Management System Troubleshooting Checklist

SYMPTOM	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
Leachate pumps not operational	1. Insufficient air pressure	1. ~~Verified~~ Verify by confirming ~~water~~ liquid level in ~~sump~~ extraction well above pump start level or lack of ~~vacuum~~ pressure at ~~sump~~wellhead. Verify pump is working by actuating pump manually ~~(place thumb over pump brain~~ drain [?] ~~exhaust outlet; pump should cycle approx. 1 time every 15 seconds)~~.	1. Increase air pressure. Air pressure should be set between 40 and 100 psi.	1. Look for leaks to determine why air pressure was too low. Repair pump.
	2. Unable to discharge	Check to see if air pressure regulator setting is too low. 2. Discharge valve or isolation valve on force main closed. Verify that pump is operational. Refer to pump manual for more information on troubleshooting the pump.	2. Check valve position at sump and at isolation valve locations. Valves should be open. Check discharge hose for correct set-up and discharge. Check force main for blockage or damage.	2. Check valve positions as part of regular ~~weekly~~ maintenance. Replace exhaust hoses. Remove pump, inspect/ clean, check valve, clean pump ~~brain~~ drain [?] by flushing with clean water, and reconnect pump. Replace pump ~~brain~~ drain [?] if pump does not function after all described steps have been followed. Repair pump.

Section 6
Alternative Operations and Maintenance

6.1 Landfill Gas Collection System

Alternative operations and maintenance of the LFG collection system are not expected. The selected components of the LFG system are designed to function in combination with the leachate collection system and final cover. In the event that a single component of the LFG system becomes nonoperational, temporary replacement equipment can be brought onto the site. For example, a replacement blower may be required.

In the event that a condensate pump becomes nonoperational, a vacuum truck or other pump can be utilized to remove condensate. Condensate collected in this manner should be transferred to the leachate storage tank for disposal.

6.2 Leachate Collection System (LCS)

Alternative operation of the leachate collection system may be necessary during the initial startup of the system depending on the quantity of leachate collected from the dual extraction wells. The leachate storage tank has a capacity of ~~20,000~~ 30,000 gallons. If the volume of leachate removed from the dual extraction wells is greater than the quantity that can be managed via the storage tank and off-site shipments of leachate, two alternative methods of operating the system are available as follows:

- **Alternative 1:** Supply additional aboveground leachate storage capacity. Additional aboveground storage tanks can be located directly east of the ~~20,000~~ 30,000-gallon underground storage tank. The additional quantity of storage capacity required will depend upon the availability of trucks to haul leachate off-site for disposal and treatment. Additional storage capacity will only serve as a temporary means of operation until collected leachate volumes can be managed adequately by trucks used for hauling.
- **Alternative 2:** Reduce leachate collection rates from dual extraction wells. Reducing collection rates of liquid can be accomplished by adjusting the regulator for the pneumatic pumps. If this method of operation is deemed necessary, pumps located in the interior of the landfill will be turned down first. Pumps located near the perimeter of the landfill should only have their flows reduced after those located in the interior of the landfill. This method of operation should only be used temporarily until more leachate hauling trucks can be arranged for or until quantities of leachate available for pumping from the waste decrease.

Section 7
Corrective Measures

This section presents a description of potential corrective actions that may be implemented in the event that cleanup or performance standards are exceeded or any RA components fail.

1.1Landfill Gas Collection System

7.1.1Within the Waste Management Unit Boundary

If areas of stressed vegetation are identified, then supplemental soil gas measurements may be made by using barhole probes or gas measurements may be made at the surface of the impacted area. If the stressed vegetation is determined to be the result of LFG migrating through the cover, then the affected area may be mitigated by one, or a combination of, the following actions:

1.Adjustment to the LFG management system in the area of impacted vegetation.

2.Conduct cover repairs to limit further movement of gas into the cover soil.

3.Install an additional LFG extraction well(s) in the area of impacted vegetation.

7.1.2LFG Probes Outside of the Waste Management Unit Boundary

Failure of the LFG management system to control off-site gas migration may result in increased monitoring and/or modifications to the LFG extraction system. As necessary, additional gas probes may be installed or the active LFG management system may be modified. Action levels and associated response actions have been established for the LFG probes (Table 7-1).

1.2Leachate Collection System

Modifications to the LCS may be necessary to improve system performance or address ineffective portions of the system. Contingencies and response actions for the leachate management system are described in Table 7-2.

Table 7-1
Action Levels and Associated Response Actions for LFG Probes

ACTION LEVEL	RESPONSE ACTION
Initial occurrence of CH_4, but below 50 percent of the Lower Explosive Limit (LEL)	Determine if CH_4 levels are the result of decaying plants and/or organic soil that is usually present around wetland environments. Background levels may be used to refine the action levels for the probes outside of the fill areas, with approval from the USEPA.
Increases in CH_4 above background, but below 50 percent LEL	Continue monitoring at the affected probe(s) as well as at neighboring probe(s) until CH_4 levels stabilize or return to background. The monitoring will be dependent on field conditions.
CH_4 >50 percent LEL	One or more of the following actions: 1. Conduct a barhole investigation to determine the extent of subsurface gas migration. 2. As appropriate, install additional LFG monitoring probes. 3. Prepare an LFG control plan describing a comprehensive set of response actions that may be taken if CH_4 levels increase above 80 percent LEL.
CH_4 >80 percent LEL	In addition to the actions described above, the response actions may include one or more of the following measures: 1. Install active extraction wells or trenches. 2. Install a passive cut off trench. 3. Install continuous gas monitors in occupied structures near the affected probe(s).

Table 7-2
Action Levels and Associated Response Actions for the Leachate Management System

ACTION LEVEL	RESPONSE ACTION
Leachate storage tank is at capacity for more than 12 hours per day, on a weekly average.	One or more of the following actions: 1. Increase loadout frequency by — increasing loadout schedule, — increasing number of tanker trucks servicing site, and 2. Install temporary storage capacity at site. 3. With the approval of the USEPA, increase the cycling time of the extraction wells such that leachate extraction rates are reduced. This action assumes that a steady long-term draw-down of leachate heads is being achieved. 4. Arrange for hook-up to the local sanitary district. 5. Make additional cap improvements.
Leachate heads are not systematically lowered throughout the landfill as shown over a course of several years.	Prepare a leachate control plan describing a comprehensive set of response actions that may be taken to systematically lower heads, including one or more of the following measures: 1. Install additional extraction wells. 2. Convert existing unused extraction wells to leachate extraction points. 3. Replace ineffective extraction points. 4. Install vertical cut-off walls around portions of the landfill perimeter.
Inward gradient is not achieved after active system implementation.	Prepare a comprehensive set of response actions that may include one or more of the following components: 1. Demonstrate that existing system is not contributing to off-site migration of landfill leachate constituents. 2. Install additional extraction points (or replace existing) in areas of noncompliance. 3. Install a perimeter gradient control trench in affected areas. 4. Install a vertical cut-off wall in affected areas.

1.3Landfill Cover System

The final cover system provides a containment layer over the waste mass, a barrier layer to the infiltration of precipitation into the waste mass, and serves to promote the drainage of surface water from the site. Occasional improvements or repairs to the final cover system are necessary to ensure these objectives are met. The most common occurrences that would require action are erosion or settlement of the final cover. Potential corrective actions to address cover erosion or settlement were described in Subsection 4. No other system failures are expected to occur.

1.4Groundwater Monitoring System/Monitored Natural Attenuation

Contingencies and response actions for groundwater monitoring and monitored natural attenuation are described in the PSVP (Volume 2 of the Remedial Design Report).

Section 7
Safety Plan

7.1 General

Personnel operating and maintaining the system should be thoroughly familiar with safety practices. Personnel are to be aware that the information in this manual is not intended to be comprehensive. All maintenance and inspection activities will be governed by the Site Health and Safety Plan. The safety precautions stated here are not to be considered the only precautions necessary, and are no substitute for an alert, informed, and responsible person. Individuals and contractors working on the site need to be familiar with their own site-specific Health and Safety Plan.

7.2 Landfill Hazards

In addition to general safety hazards that may be present in any work situation, hazards specific to landfill sites may also be present. Employees may expect to encounter, at a minimum, the following hazards when operating and maintaining the landfill gas extraction system:

- Fires and explosions may occur from the presence of methane gas.
- Landfill gases may cause an oxygen-deficient atmosphere in underground vaults, trenches, structures, and conduits.
- Hydrogen sulfide, a highly toxic and flammable gas, may be present.
- Fires may start spontaneously from exposed and/or decomposing refuse.
- Lateral gas migration to adjacent areas in addition to venting to the atmosphere through the cover soil may occur.
- Direct contact with LFG condensate and leachate should be avoided.

7.3 Fire and Explosion Safety

Landfill personnel must be trained in the use of fire extinguishers and must be familiar with their locations on-site. In the event of a major fire, all personnel must leave the area of the fire and notify the ~~fire department~~Fire Department. Do not attempt to use a fire extinguisher on a major landfill gas fire.

If an explosion occurs, further explosions must be prevented by isolating the source of ignition, if possible. Keep people a safe distance from the site of the explosion. For both fires and

explosions, the gates to the facility or to the blower/flare area must be kept closed to all but emergency vehicles.

7.4 Electrical Safety

1. Lock-out and tag main switch of electrical equipment before working on it.
2. Do not remove the tag without first checking with the person who initiated the tag.
3. Notify supervisor in the event a motor circuit breaker trips out.
4. Do not open motor control panels unless you are trained and authorized to perform the work.
5. Report and log any unusual motor noise or vibration.

7.5 Confined Space Safety

Poor ventilation within certain structures in the landfill gas extraction system may result in one or more of the following hazards: toxic gas accumulation, flammable or explosive atmosphere, or oxygen deficiency. These structures include the following:

- Flare
- Well encasements
- Valve boxes
- Blower building
- Leachate collection tank

Depending on the situation, these structures may be defined as either confined spaces or permit-required confined spaces, and each requires that special safety precautions be taken.

7.6 Site Safety Rules

All employees shall observe and obey every rule, regulation, and order necessary for the safe conduct of the work, and shall take such action as is necessary to obtain compliance. Employees shall report all unsafe conditions or practices to the appropriate person or agency.

7.7 First Aid

Prompt attention to injuries is important.

1. Call a physician for all but minor injuries. Contact the Fire Department immediately in cases where resuscitation is needed and when landfill gas mishaps occur.
2. If there is a possibility of coming into contact with condensate formed on the inside of the piping system or leachate, wear rubber gloves. This will prevent exposure to potentially

hazardous compounds, especially if the hands are chapped or burned, or if the skin is broken in any other manner.

3. Keep fingers away from the nose, mouth, and eyes to prevent exposure.
4. Wash hands thoroughly after work and before eating. The use of antiseptic solutions will help prevent infection.
5. Keep the nails short and remove foreign material with a nail file or stiff soapy brush.
6. Keep in mind that, when the hands are soiled, smoking pipes or contaminated ends of cigarettes or cigars may introduce potentially hazardous compounds into the body.
7. Do not smoke near any areas of the gas system.

Section 8
Reporting

8.1 General

In accordance with Section III, Task 4 of the SOW, at a minimum, the USEPA and the Illinois EPA will be provided with signed quarterly reports for the O&M phase.

This section describes the content of the quarterly progress reports that will be submitted during the O&M phase. Several other miscellaneous records and reporting mechanisms are also discussed in this section. These items will be attachments to the progress reports.

8.2 Progress Reports During O&M

The quarterly O&M report will provide a summary of the effectiveness of the RA. Data on system operation, operating problems, and monitoring (when applicable) will be supplied. The quarterly reports will provide the formal transmittal of laboratory test data or field measurements to the agencies. Each report will include a discussion of the effectiveness of the systems in achieving the RA requirements and a description of any proposed operational changes if required. The quarterly O&M reports will also provide a summary of sampling and analysis activities; chart contaminant levels by well, media, contaminant, and location; and provide comments on contaminant level trends.

In general, the O&M progress reports will contain the following information:

- A summary of operational conditions, maintenance activities performed, and repairs required on the RA components, including the following:
    - LFG management system
    - Leachate management system
    - Landfill cover system
- A summary of all approved and unapproved changes made since the last report submission
- A summary of all problems or potential problems encountered during the reporting period and actions taken to correct the problems
- Data tables providing quantitative data on the systems
- A summary of the maintenance procedures implemented during the reporting period
- Any required changes to maintenance frequency
- Repairs implemented outside of the scope of normal maintenance

- Summary of performance of the RA components
- Summaries of contact with representatives of the local community, public interest groups, or local or state governments
- Changes in personnel
- Projected work for the next reporting period
- Appendices as follows:
    - Laboratory test data
    - Field measurement logs
    - Maintenance records
    - Inspection reports
    - ~~Incidence~~ Incident reports
    - Repair reports

8.3 Miscellaneous Reports

During the O&M period, miscellaneous reports will be submitted as attachments to the O&M reports, as warranted. This section describes the general content of these miscellaneous reports.

8.3.1 Inspection Report

As stated in this O&M Plan, inspections will be conducted on the landfill cap and security fence, the leachate and LFG systems, and the monitoring wells. Inspection forms for these activities (see Appendix C) will constitute the inspection report.

8.3.2 Incident Report

An incident report form will be completed in the event of miscellaneous occurrences on-site that impact site operations. These may include fires, equipment breakages/damages, accidents/injuries, and weather-induced damages. This report will include the following information:

- Date/Time of incident
- Type of occurrence
- Names of personnel reporting
- Names of personnel involved
- Type of equipment involved
- Summary of actions

8.3.3 ~~Repair~~ Maintenance Report

If significant repairs are made to the cover system, monitoring systems, or leachate and gas management systems, a report describing the extent of the repairs will be prepared and attached to the quarterly O&M report.

8.4 Reporting Schedule

Quarterly reports will also be submitted within 30 days of the end of the quarter reporting period. This will allow for laboratory turntime and data evaluation. The first O&M report submitted will be for the quarterly reporting period following ~~completion of the final RA inspection and submittal of the~~ approval of the RA Construction Completion Report.

Quarterly O&M reports will be replaced by less frequent reports if the USEPA approves a monitoring frequency that is less than quarterly. For a further discussion of reporting and performance requirements, refer to ~~the~~ Section 7 of the PSVP~~, Volume 2 of the RD Report~~.

Appendix C
Monitoring Inspection Forms

Facility Inspection Report
H.O.D. Landfill
Antioch, Illinois

NOTE: Inspector using this form shall be familiar with Section 4 of the O&M Plan. Mark the location of any potential problems on the attached site map regardless if maintenance is required.

DATE: _____

INSPECTOR: _____

TEMPERATURE: _____

WEATHER: _____

GROUND CONDITIONS: _____

ITEM	COMMENTS/OBSERVATIONS	Adequate	Requires Maintenance
Final Cover			
1. Vegetation	_____	☐	☐
2. Erosion	_____	☐	☐
3. Burrowing	_____	☐	☐
4. Settlement	_____	☐	☐
5. Leachate seeps	_____	☐	☐
6. Other	_____	☐	☐

ITEM	COMMENTS/OBSERVATIONS	Adequate	Requires Maintenance

Groundwater Wells/Gas Probes

Describe below (see next page) the nature of any damage, deterioration, or vandalism observed and required maintenance. At a minimum, the following components of each well and probe shall be inspected: (1) protective casing; (2) well stick-up, cap, and conditions inside protective casing; (3) surface seal; (4) well I.D. label; (5) locks.

1. Identify well/probe number and problems observed, if any. _____ ☐ ☐

Extraction Wells/Condensate Sumps

Inspect well assemblies for loose bolts, cracks in pipes, air or liquid leaks in pipes, broken valve controls, evidence of differential settlement (such as stretching of the flex hose), or other evidence of integrity failure. Describe the nature of any damage, deterioration, or vandalism observed and required maintenance. Identify the extraction well number for problems observed, if any.

1. Differential settlement _____ ☐ ☐
2. Hardware, locks, pipes, and valves _____ ☐ ☐
3. Pump/Sump _____ ☐ ☐
4. Leaks _____ ☐ ☐
5. Other _____ ☐ ☐

ITEM	COMMENTS/OBSERVATIONS	Adequate	Requires Maintenance
Extraction System Piping			
1.	Header isolation valves _____	☐	☐
2.	Condensate surging _____	☐	☐
3.	Settlement _____	☐	☐
4.	Other _____	☐	☐
Blower Facility			
1.	Piping, fittings, valves, seals _____	☐	☐
2.	Blower _____	☐	☐
3.	Exhaust fan _____	☐	☐
4.	Gas sensor _____	☐	☐
5.	Other _____	☐	☐
Flare			
1.	Flame arrestor _____	☐	☐

ITEM	COMMENTS/OBSERVATIONS	Adequate	Requires Maintenance
2.	Ignitor _____	☐	☐
3.	Refractory _____	☐	☐
4.	Solenoids _____	☐	☐
5.	Other _____	☐	☐

Fencing and Signs

1.	Fencing _____	☐	☐
2.	Gates and locks _____	☐	☐
3.	Signs _____	☐	☐
4.	Other _____	☐	☐

Access Road

1.	Accessibility _____	☐	☐
2.	Other _____	☐	☐

Maintenance Report
H.O.D. Landfill
Antioch, Illinois

Prepared By: _____

Date Prepared: _____

Date(s) Maintenance Performed: _____

Name of Contractor(s): _____

_____

Type of Maintenance	Scheduled	Responsive	Nature of Work Performed
☐ Groundwater well	☐	☐	
☐ Gas probe	☐	☐	
☐ Extraction wells/ condensate sumps		☐	
☐ Extraction system piping	☐	☐	
☐ Blower facility	☐	☐	
☐ Flare	☐	☐	
☐ Vegetation	☐	☐	
☐ Erosion control		☐	
☐ Settlement		☐	
☐ Access road	☐	☐	
☐ Fencing/Signs	☐	☐	
☐ Leachate seep		☐	
☐ Other		☐	

DETAILED DESCRIPTION OF MAINTENANCE PERFORMED:

(Attach additional pages if necessary and contractor's invoice with description of services rendered, if applicable).

_____

_____

_____

_____

_____

_____

_____

_____

Cost: $_____

Professional Engineer or Firm Preparing Documentation: _____
(if applicable, i.e., settlement repair, leachate seep repair)

Landfill Gas/Leachate Monitoring
H.O.D. Landfill
Antioch, Illinois

Person sampling: _____ Date: _____ Notes: _____

Ambient temperature: _____ °F _____

Barometric pressure: _____ in. Hg _____

Trend in barometric pressure: _____ _____

Weather conditions: _____ _____

Ground conditions: _____ _____

Gas/O_2 meter model: _____ Serial #: _____

Date last calibrated: _____ _____

LOCATION	WELL-SIDE PRESSURE	HEADER SIDE PRESSURE	% CH_4	% O_2	% CO_2	% BAL.	TEMP.	ORIFICE PLATE DP	FLOW RATE	VALVE % OPEN	VALVE ADJUSTMENT	LEACHATE PUMP CYCLE #	LEACHATE DEPTH
Blower outlet	NA									NA	NA	NA	NA
Blower inlet	NA							NA	NA			NA	NA
GWF-2													
GWF-3													
GWF-4													
GWF-5													
GWF-8													
GWF-10													
GW-15													
GW-16													
GW-17													

Landfill Gas/Leachate Monitoring
H.O.D. Landfill
Antioch, Illinois

LOCATION	WELL-SIDE PRESSURE	HEADER SIDE PRESSURE	% CH_4	% O_2	% CO_2	% BAL.	TEMP.	ORIFICE PLATE DP	FLOW RATE	VALVE % OPEN	VALVE ADJUSTMENT	LEACHATE PUMP CYCLE #	LEACHATE DEPTH
GW-18													
GW-19													
GW-20													
GW-21													
GW-22													
GW-23													
GW-24													
GW-25													
GW-26													
GW-27													
GW-28													
GW-29													
GW-30													
GW-31													
GW-32													
GW-33													
GW-34													

Landfill Gas/Leachate Monitoring
H.O.D. Landfill
Antioch, Illinois

LOCATION	WELL-SIDE PRESSURE	HEADER SIDE PRESSURE	% CH_4	% O_2	% CO_2	% BAL.	TEMP.	ORIFICE PLATE DP	FLOW RATE	VALVE % OPEN	VALVE ADJUSTMENT	LEACHATE PUMP CYCLE #	LEACHATE DEPTH
LP1													
LP2													
LP3													
LP4													
LP8													
LP10													
LP11													
MHE													
MHW													

LOCATION	PRESSURE	% CH_4	LEL CH_4	% O_2	% CO_2	% BAL.							
GP3							NA	NA	NA	NA	NA	NA	NA
GP4A							NA	NA	NA	NA	NA	NA	NA
GP5A							NA	NA	NA	NA	NA	NA	NA
GP6							NA	NA	NA	NA	NA	NA	NA
GP7							NA	NA	NA	NA	NA	NA	NA
GP8							NA	NA	NA	NA	NA	NA	NA

Note:
NA = not applicable.

Incident Report
H.O.D Landfill
Antioch, Illinois

Person reporting incident: _____ Date: _____

Date of incident: _____ Time of incident: _____

Description of incident: _____

_____

_____

_____

_____

_____

Names of personnel involved: _____

_____

_____

Types of equipment involved: _____

_____

_____

Summary of actions taken: _____

_____

_____

_____

_____

_____

Required follow-up: _____

_____

_____

_____